CLAIMS

WHAT IS CLAIMED IS:

1. An optical device comprising:

a fixed structure;

a movable structure to move relative to the fixed structure and being disposed adjacent to the fixed structure;

a first light guiding structure mounted on the fixed structure, the first light guiding structure comprising a different material than the fixed structure;

a second light guiding structure mounted on the movable structure, the second light guiding structure comprising a different material than the movable structure, each of the first and second light guiding structures having an end such that the ends of the first and second light guiding structures are aligned to propagate an optical signal between the first and second light guiding structures; and

a flexure having a first end coupled to the movable structure and a second end coupled to the fixed structure, the flexure having a first point that remains in zero or near-zero translation, the ends of the first and second light guiding structures being positioned at or near the first point of the flexure.

2. The optical device of claim 1 wherein the first point is at the centerline halfway between the first and second ends of the flexure.

3. The optical device of claim 1 wherein the first point is located a distance from the centerline halfway between the first and second ends of the flexure.

4. The optical device of claim 1 wherein the first light guiding structure is a waveguide.

5. The optical device of claim 1 wherein the second light guiding structure is a waveguide.

6. The optical device of claim 4 wherein the second light guiding structure is a waveguide.

7. The optical device of claim 2 further comprising a second flexure having a first end coupled to the movable structure and a second end coupled to the fixed structure, the second flexure having a centerline halfway between the first and second ends of the flexure, the ends of the first and second light guiding structures being positioned at or near the centerline of the second flexure.

8. The optical device of claim 1 wherein the ends of the first and second light guiding structures are positioned at substantially equal distance from the first point of the flexure.

9. The optical device of claim 7 wherein the ends of the first and second light guiding structures are positioned at substantially equal distance from the first point of the second flexure.

10. The optical device of claim 1 wherein the flexure has a first bend and a second bend, the first and second bends being located on opposite sides of the first point.

11. The optical device of claim 10 wherein the flexure has a third bend and a fourth bend, the third and fourth bends being located on opposite sides of the first point.

12. The optical device of claim 3 further comprising a second flexure having a first end coupled to the movable structure and a second end coupled to the fixed structure, the second flexure having a second point that remains in zero or near-zero translation, the ends of the first and second light guiding structures being positioned at or near the second point of the second flexure.

13. The optical device of claim 8 wherein the first point is at the centerline halfway between the first and second ends of the flexure.

14. The optical device of claim 9 wherein the first point is at the centerline halfway between the first and second ends of the flexure.

15. The optical device of claim 1 wherein the flexure has a first bend and a second bend, the first and second bends being located on opposite sides of the first point, the first point being at the centerline halfway between the first and second ends of the flexure.

16. An optical device comprising:

a fixed structure;

a movable structure to move relative to the fixed structure and being disposed adjacent to the fixed structure;

a first light guiding structure mounted on the fixed structure, the first light guiding

structure comprising a different material than the fixed structure;

a second light guiding structure mounted on the movable structure, the second light guiding structure comprising a different material than the movable structure, each of the first and second light guiding structures having an end such that the ends of the first and second light guiding structures are aligned to propagate an optical signal between the first and second light guiding structures; and

the fixed structure including a base and an overhang portion which protrudes beyond the base, the overhang portion having dimensions such that when the optical device is subject to a thermal distortion, the ends of the first and second light guiding structures maintain alignment with each other to be capable of propagating an optical signal.

17. The optical device of claim 16 wherein the dimensions of the overhang portion result in the fixed structure and the first light guiding structure being displaced under a thermal influence by the same amount that the movable structure and the second light guiding structure are displaced by the thermal influence.

18. The optical device of claim 16 wherein the first light guiding structure is a waveguide.

19. The optical device of claim 16 wherein the second light guiding structure is a waveguide.

20. The optical device of claim 18 wherein the second light guiding structure is a waveguide.

21. The optical device of claim 16 further comprising:

a second fixed structure positioned adjacent the movable structure;

a third light guiding structure mounted on the second fixed structure, the third light guiding structure comprising a different material than the second fixed structure; and

the second fixed structure including a base and an overhang portion which protrudes beyond the base, the overhang portion having dimensions such that when the optical device is subject to a thermal distortion, the ends of the second and third light guiding structures are aligned with each other to be capable of propagating an optical signal.

22. The optical device of claim 16 wherein the side of the overhang portion adjacent to the movable structure is narrower than the movable structure.

23. An optical device for propagating an optical signal, the optical device comprising:

a fixed structure formed by a semiconductor process;

a movable structure formed by a semiconductor process to move relative to the fixed structure and being disposed adjacent to the fixed structure;

a first light guiding structure mounted on the fixed structure, the first light guiding structure comprising a different material than the fixed structure;

a second light guiding structure mounted on the movable structure, the second light guiding structure comprising a different material than the movable structure, each of the first and second light guiding structures having an end such that the ends of the first

and second light guiding structures are aligned to propagate the optical signal between the first and second light guiding structures, the ends of the first and second light guiding structures to maintain alignment with each other in the presence of thermal distortion so that the first and second light guiding structures can propagate an optical signal.

24. The optical device of claim 23 further comprising a slot in the fixed or movable structure, the slot helping to maintain alignment of the ends of the first and second light guiding structures with each other in the presence of thermal distortion.

25. The optical device of claim 23 further comprising an optically extraneous waveguide mounted to the fixed or movable structure, the extraneous waveguide helping to maintain alignment of the ends of the first and second light guiding structures with each other in the presence of thermal distortion.

26. The optical device of claim 23 wherein the first light guiding structure is a waveguide.

27. The optical device of claim 23 wherein the second light guiding structure is a waveguide.

28. The optical device of claim 26 wherein the second light guiding structure is a waveguide.

29. The optical device of claim 23 wherein the ends of the first and second light guiding structures bend substantially the same amount in order to maintain

alignment with each other in the presence of thermal distortion so that the first and second light guiding structures can propagate an optical signal.

30. The optical device of claim 23 wherein the movable structure has a first side and a second side, the second light guiding structure being mounted on the first side of the movable structure, and a third structure formed on the second side of the movable structure, the third structure being configured to substantially cancel the thermal distortion of the second light guiding structure.

31. The optical device of claim 30 wherein the first light guiding structure is a waveguide.

32. The optical device of claim 30 wherein the second light guiding structure is a waveguide.

33. The optical device of claim 31 wherein the second light guiding structure is a waveguide.

34. An optical device for propagating an optical signal, the optical device comprising:

a fixed structure formed by a semiconductor process;

a movable structure formed by a semiconductor process to move relative to the fixed structure and being disposed adjacent to the fixed structure;

a first light guiding structure mounted on the fixed structure, the first light guiding structure comprising a different material than the fixed structure;

a second light guiding structure mounted on the movable structure, the second light guiding structure comprising a different material than the movable structure;

a third structure comprising the same material as the movable structure and formed on the second light guiding structure so that the second light guiding structure is positioned between the movable structure and the third structure;

each of the first and second light guiding structures having an end such that the ends of the first and second light guiding structures are aligned to propagate the optical signal between the first and second light guiding structures, the ends of the first and second light guiding structures to maintain alignment with each other in the presence of thermal distortion so that the first and second light guiding structures can propagate an optical signal.

35. The optical device of claim 34 wherein the first light guiding structure is a waveguide.

36. The optical device of claim 34 wherein the second light guiding structure is a waveguide.

37. The optical device of claim 35 wherein the second light guiding structure is a waveguide.

38. The optical device of claim 34 wherein the third structure is configured to maintain the ends of the first and second light guiding structures in alignment with each other in the presence of thermal distortion.

39. A method of fabricating an optical device for propagating an optical signal, the method comprising:

providing a first substrate having a first side and a second side;

forming a first light guiding structure on the first side of the first substrate, the first light guiding structure comprising a different material than the first substrate;

forming a dielectric layer on the first substrate or on a second substrate;

etching a cavity to remove a portion of the dielectric layer and a portion of the second substrate;

bonding the first substrate to the second substrate such that the dielectric layer is located between the first and second substrates and the first light guiding structure resides in the cavity;

reducing the thickness of the second side of the first substrate;

forming a second light guiding structure on the second side of the first substrate; and

processing the first substrate to form a suspended structure which is adapted to move relative to the second substrate, the suspended structure having the first and second light guiding structures.

40. The method of claim 39 wherein the first light guiding structure is a waveguide.

41. The method of claim 39 wherein the second light guiding structure is a waveguide.

42. The method of claim 40 wherein the second light guiding structure is a waveguide.

43. The method of claim 39 wherein the first light guiding structure includes a plurality of waveguides.

44. An optical device comprising:

a substrate including a suspended structure that is adapted to move relative to the substrate, the suspended structure having a first surface and a second surface, the first and second surfaces being on opposite sides of the suspended structure;

a light guiding structure disposed on the first surface of the suspended structure; and

a thermal distortion offset structure formed on the second surface of the suspended structure, the thermal distortion offset structure configured to counteract a thermal distortion to the first surface of the suspended structure.

45. The optical device of claim 44 wherein the light guiding structure is a waveguide.

46. The optical device of claim 45 wherein the first and second surfaces are top and bottom surfaces of the suspended structure.

47. The optical device of claim 45 wherein the thermal distortion offset structure is made of the same material as the waveguide.

48. The optical device of claim 47 wherein the thermal distortion offset structure includes a second waveguide.

49. The optical device of claim 48 wherein the thermal distortion offset structure is a second waveguide whose configuration differs from the configuration of the waveguide.

50. The optical device of claim 45 wherein the first and second surfaces are side surfaces of the suspended structure, the side surfaces being generally orthogonal to the top surface of the suspended structure.

51. The optical device of claim 50 further comprising a top layer disposed on the suspended structure, the top layer covering the waveguide.